Trend Study 25C-15-03

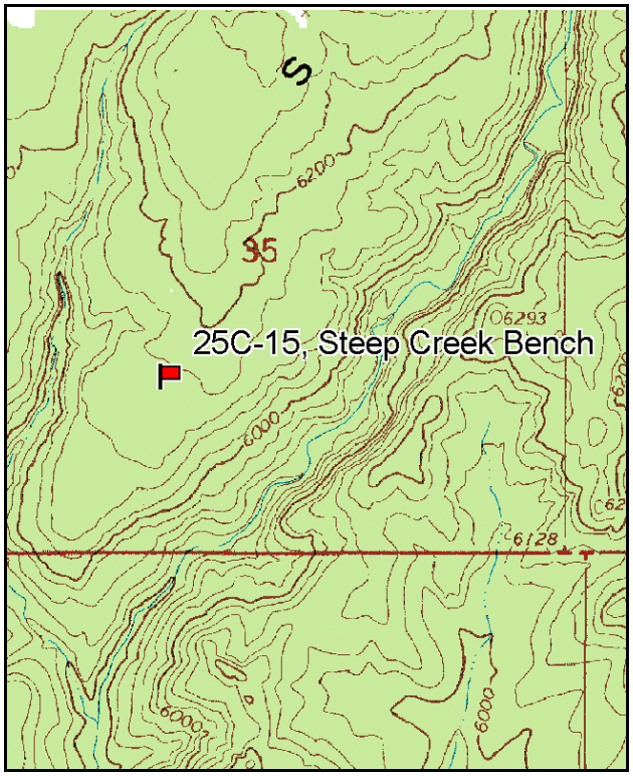
Study site name: Steep Creek Bench . Vegetation type: Pinyon-Juniper .

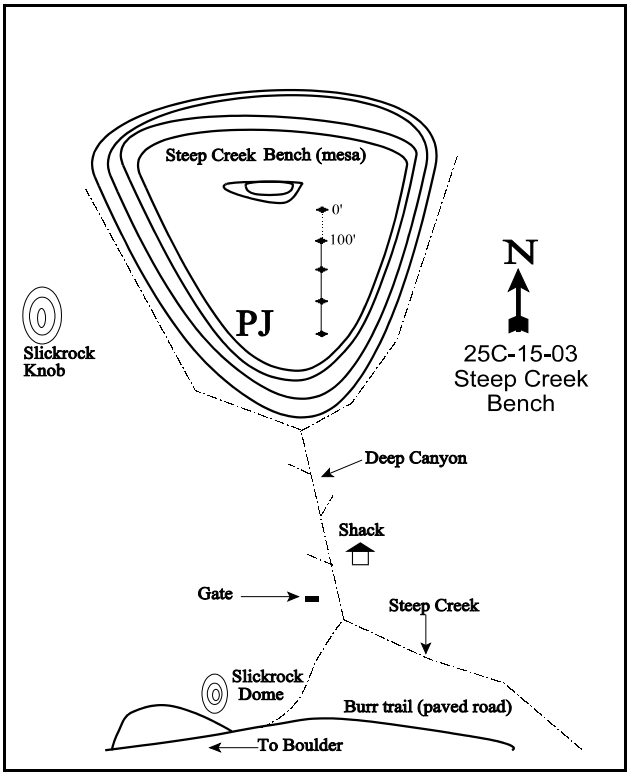
Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line4 (71ft). No rebar.

LOCATION DESCRIPTION

From the town of Boulder, take the Burr Trail for about 6.2 miles to Deer Creek. Continue on the road for 2.0 miles to a large sandstone monolith on the left and a pullout at its base. This is the start of the trail to Steep Creek. Follow the wash on the east side of the Slickrock Dome, staying on the west side of the ravine following an old cattle trail, 1/2 - 3/4 miles north to Steep Creek. Cross steep creek and travel upstream on the north side of the creek for approximately 1 mile to a minor fork. Pick your way up the ridge between Steep Creek and the fork to the top of the bench. Continue north through the P-J to the first major sage/grass opening. The transect is located in this opening. Bearings to visible landmarks are detailed on the accompanying map. The study markers are 1-foot tall fenceposts, and the 0-foot baseline stake is tagged #7132.





Map Name: Steep Creek Bench Diagrammatic Sketch

Township 33S , Range 5E , Section 35 GPS: NAD 27, UTM 12S 4193508 N, 471324 E

DISCUSSION

Steep Creek Bench - Trend Study No. 25C-15

Steep Creek Bench is located in the rugged, inaccessible canyon country of "The Gulch" drainage south of Boulder Mountain. Deer and elk that move south off the mountain can end up here in winter. There are a few deer that stay in this low country all year long. Low annual precipitation, slick rock, and sandy soil limit the potential vegetative types to "sparse" pinyon-juniper with scattered small open parks of sagebrush and grass. This extensive type is represented by the study on the south end of Steep Creek Bench. The terrain is nearly level at the site and exposure is insignificant with an elevation of 6,100 feet. The area is used by deer and cattle. Pellet group data from 1998 estimated 27 deer and 9 cow days use/acre (67 ddu/ha and 22 cdu/ha). Cow sign appeared to be from the previous winter. Deer antler sheds were also found in 1998. Pellet group quadrat frequency data shows similar use in 1994. Rabbit sign was also frequent. Pellet group data from 2003 estimated much lower deer use at only 2 days use/acre (5 ddu/ha). One elk pellet group was also encountered. Cattle use was estimated at 6 days use/acre (14 cdu/ha). Rabbit pellets remain common with a quadrat frequency of 46%.

Soil is a deep, loose sand with an effective rooting depth estimated at just over 22 inches. The soil has a neutral reaction (pH 7.2). Phosphorus is low at only 3 ppm as 10 ppm is considered a minimum value. Soil organic matter is also very low at only 0.3%. Percent bare ground is abundant averaging 47% in 1998 and 72% in 2003. There are large bare interspaces between trees and shrubs. There are signs of both water and wind erosion occurring and the erosion condition class was determined to be slight in 2003. However, the slight slope limits water erosion. In some recurrent open spots, constantly shifting dunes are formed by the wind. Weather-scoured depressions and wind deposition may cause more significant soil movement than water erosion.

Mature pinyon and juniper trees are the dominant overstory. The stand is open, with many stunted older trees because of poor site potential. Point-quarter data taken in 1994, 1998, and 2003 estimated tree density at around 60 trees/acre, with pinyon making up over half. Basal diameter of pinyon averaged 6 inches in 2003 while juniper averaged 13 inches. Over half of the pinyon and juniper sampled were greater than 12 feet in height. These trees combine to provide half of the browse cover on the site. The trees provide good cover, but are rarely utilized for forage.

Wyoming big sagebrush occurs within the openings. The stand is old and not very abundant producing around 3 % cover in 1998 and 2003. Density has remained relatively stable since 1994 at around 700 plants/acre. The stand is overly mature with a consistent high rate of decadence since study site establishment. Reproduction has been poor during most readings with few seedlings or young encountered. Utilization has been light to moderate with heavier use reported in 1987 and 1991. Vigor has been poor on about 1/3 of the population during each reading except for 1994 when vigor was normal on all but 8% of the plants sampled.

A few scraggly rubber rabbitbrush and ephedra are the only other palatable browse encountered on this end of the mesa. The most numerous woody plant is a small broom snakeweed which has fluctuated greatly in density over the years. Population density has ranged from 233 plants/acre in 1991 to 3,660 in 1998.

Herbaceous forage is limited. The most abundant grasses, sandpile muhly and blue grama, are both warm season increasers. They are not very palatable or productive, but in high numbers, they can provide good soil protection. Other species include sand dropseed, Indian ricegrass, and bottlebrush squirreltail. All grasses combined produced only 6% cover in 1994 and 1998, dropping to 3% in 2003 with severe drought. Forbs are very limited. The only fairly common species are Carruth sage and a cryptantha which provided 90% of the forb cover in 1998.

1987 APPARENT TREND ASSESSMENT

Ground cover conditions are poor with abundant bare ground exposed. Erosion is occurring but it is not severe due to the gentle terrain. The key browse, Wyoming big sagebrush, has a low density of 532 plants/acre. Use is moderate to heavy, vigor poor on 38% of the plants sampled, and 1/3 of the population is decadent. Young plants appear to be abundant enough to maintain the stand. The herbaceous understory is poor and dominated by warm season increasers, blue grama, and sandpile muhly. A few forbs are moderately abundant.

1991 TREND ASSESSMENT

There is almost no rock or pavement to help protect what soils are left after the soil is eroded away by the wind and water. Vegetative basal cover is almost unchanged, from 4% to 5%. Litter cover has gone from 34% down to 24%. Percent bare ground has increased from 58% to 65%. Cryptograms have increased from 4% to 6%. This still points to a slightly downward trend for soil. The key browse species, Wyoming big sagebrush, has decreased by 12% in density, while percent decadence has increased from 31% to 64%. The population is now at only 466 plants/acre. The only good point for browse on this site was that broom snakeweed's population decreased by 91%. The trend for browse would still be down slightly. The forb component of the herbaceous understory is poor. Most species only occur at very low frequencies. Carruth sage is the only forb with a very high frequency. There are five grasses that occur on the site. All are warm season increaser species except for Indian ricegrass, which is a cool season grass that has increased since the 1987 survey. Trend is considered stable for the herbaceous understory.

TREND ASSESSMENT
soil - down slightly (2)
browse - down slightly (2)
herbaceous understory - stable (3)

1994 TREND ASSESSMENT

Basic ground cover has continued to decline slightly since 1991. Percent bare ground for 1994 is 64% and cryptogamic crusts have declined from 6% cover to 2%. The new method used this year estimates aerial cover instead of basal cover so comparisons between 1991 and 1994 on vegetation cover should not be made. However, aerial cover is quite low at 14%. Trend for soil is slightly down. Trend for browse is mixed. Percent decadence has declined for Wyoming big sagebrush, vigor has improved and no shrubs were heavily hedged. The only down side for sagebrush is the lack of seedling and young plants. Another negative factor is the apparent rebound in the broom snakeweed population. Some, but probably not all of the increase in snakeweed can be explained by the new larger sample taken in 1994. Trend for browse is therefore, stable at this time and will likely improve with normal precipitation patterns. The herbaceous understory is in poor condition and dominated by warm season increasers, sandhill muhly and blue grama, which produce little forage. The more preferred grasses, Indian ricegrass and sand dropseed, occur in small numbers. Indian ricegrass dropped significantly while blue grama and sandpile muhly remained stable. Forbs are scarce. Sum of nested frequency of perennial grasses and forbs have remained similar to 1991 and trend is considered stable.

TREND ASSESSMENT
soil - slightly down (2)
browse - stable (3)
herbaceous understory - stable (3)

1998 TREND ASSESSMENT

Trend for soil is up with a major decline in percent bare ground from 64% in 1994 to 47% by 1998. In addition, litter cover doubled and cover of cryptogamic plants increased from only 2% to 15%. The rise in cryptogamic cover may be partly due to recent rain which makes these crusts easier to see. Vegetative cover also increased from 14% to 20%. Trend for the key browse species, Wyoming big sagebrush, is down slightly. Utilization is heavier than 1994, there is a higher proportion of plants displaying poor vigor, percent decadence is similar, but reproduction is still poor. Currently, there are more decadent/dying sagebrush (140 plants/acre) than young plants to replace them (80 plants/acre). In addition, density has declined 13% since 1994 and broom snakeweed has increased 62%. Trend for the herbaceous understory is up slightly. Sum of nested frequency of perennial grasses and forbs has increased. Production of forbs increased from less than 1% cover in 1994 to 3.7% by 1998. This is most likely due to better precipitation patterns which occurred in 1997 and 1998. Production of perennial grasses remained similar to 1994 at about 6% cover but sum of nested frequency of perennial grasses rose by 19%.

TREND ASSESSMENT
soil - up but poor (5)
browse - down slightly (2)
herbaceous understory - up slightly (4)

2003 TREND ASSESSMENT

Trend for soil is down with a 55% increase in percent cover of bare ground from 47% to 72%. Vegetation and litter cover also declined. Cryptogamic cover declined from 15% to less than 1%. Erosion is still not severe due to the slight slope but overland water flow was evident in some areas from recent rain. Trend for Wyoming big sagebrush is down slightly. Use is lighter but the number of plants displaying poor vigor increased to 35% and 43% of the population is now classified as decadent. No seedlings or young were encountered. In addition, 81% of the 320 decadent plants sampled were classified as dying (>50% crown death). Trend for the herbaceous understory is down slightly. Sum of nested frequency of perennial grasses declined by 38% with a significant drop in the nested frequency of sandpile muhly and Indian ricegrass. Total perennial grass production declined from 6% cover in 1998 to 3% in 2003. Sum of nested frequency of perennial forbs remained stable but cover declined 49% from 3.6% to 1.9%.

TREND ASSESSMENT
soil - down (1)
browse - down slightly (2)
herbaceous understory - down slightly (2)

HERBACEOUS TRENDS --
Management unit 25C, Study no: 15

Type	Species	Nested Frequency					Average Cover %		
		'87	'91	'94	'98	'03	'94	'98	'03
G	Bouteloua gracilis	$_{ab}$45	$_{a}$36	$_{ab}$49	$_{b}$71	$_{ab}$60	.80	1.95	1.49
G	Hilaria jamesii	-	-	5	-	-	.03	-	-
G	Muhlenbergia pungens	$_{ab}$80	$_{b}$116	$_{b}$109	$_{b}$101	$_{a}$52	4.89	4.05	1.20
G	Oryzopsis hymenoides	$_{abc}$22	$_{c}$35	$_{ab}$18	$_{bc}$32	$_{a}$4	.23	.12	.03
G	Sitanion hystrix	-	-	1	2	-	.03	.01	-
G	Sporobolus cryptandrus	30	23	11	24	27	.13	.23	.51
G	Vulpia octoflora (a)	-	-	$_{a}$3	$_{b}$32	$_{a}$5	.00	.07	.01
Total for Annual Grasses		0	0	3	32	5	0.00	0.07	0.00
Total for Perennial Grasses		177	210	193	230	143	6.13	6.38	3.23
Total for Grasses		177	210	196	262	148	6.14	6.45	3.24
F	Ambrosia acanthicarpa	-	3	-	-	-	-	-	-
F	Arabis spp.	-	-	3	2	-	.00	.00	-
F	Artemesia carruthii	$_{c}$58	$_{a}$16	$_{ab}$26	$_{bc}$44	$_{ab}$33	.74	1.16	1.04
F	Astragalus spp.	-	-	-	5	-	-	.01	-
F	Chenopodium album (a)	-	3	-	-	-	-	-	-
F	Cryptantha cinerea	$_{ab}$2	$_{b}$7	$_{ab}$2	$_{c}$32	$_{a}$-	.00	2.19	-
F	Descurainia pinnata (a)	-	-	10	5	2	.01	.01	.00
F	Dithyrea wislizenii (a)	-	5	-	-	7	-	-	.19
F	Eriogonum cernuum (a)	-	3	2	-	-	.00	-	-
F	Erigeron spp.	-	-	-	1	-	-	.00	-
F	Euphorbia spp.	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$36	-	-	.14
F	Gilia spp. (a)	-	-	$_{a}$-	$_{b}$17	$_{a}$-	-	.10	-
F	Hymenopappus filifolius	5	1	-	-	-	-	-	-
F	Lappula occidentalis (a)	-	-	-	3	-	-	.00	-
F	Oenothera lavandulaefolia	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$25	$_{a}$3	-	.18	.15
F	Penstemon spp.	-	-	2	4	3	.00	.01	.00
F	Phlox longifolia	-	-	-	4	1	-	.01	.00
F	Stephanomeria exigua (a)	-	$_{a}$2	$_{a}$-	$_{a}$-	$_{b}$43	-	-	.30
F	Unknown forb-annual (a)	-	-	-	-	7	-	-	.04
F	Unknown forb-perennial	12	-	-	-	-	-	-	-
Total for Annual Forbs		0	13	12	25	59	0.01	0.12	0.54
Total for Perennial Forbs		77	27	33	117	76	0.75	3.60	1.35
Total for Forbs		77	40	45	142	135	0.77	3.72	1.89

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --
Management unit 25C, Study no: 15

Type	Species	Strip Frequency			Average Cover %		
		'94	'98	'03	'94	'98	'03
B	Artemisia tridentata wyomingensis	26	27	24	2.43	3.52	2.88
B	Chrysothamnus nauseosus	0	1	0	-	-	-
B	Chrysothamnus viscidiflorus	0	1	6	-	-	.05
B	Ephedra viridis	1	0	2	.85	-	.85
B	Gutierrezia sarothrae	36	47	14	.50	.93	.21
B	Juniperus osteosperma	0	2	2	1.92	2.38	2.07
B	Opuntia spp.	5	5	1	.00	.15	-
B	Pinus edulis	0	2	2	2.20	2.26	1.82
Total for Browse		68	85	51	7.90	9.27	7.90

CANOPY COVER, LINE INTERCEPT --
Management unit 25C, Study no: 15

Species	Percent Cover
	'03
Artemisia tridentata wyomingensis	1.81
Chrysothamnus viscidiflorus	.08
Ephedra viridis	1.64
Gutierrezia sarothrae	.10
Juniperus osteosperma	4.58
Pinus edulis	2.71

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 25C, Study no: 15

Species	Average leader growth (in)
	'03
Artemisia tridentata wyomingensis	1.4

POINT-QUARTER TREE DATA --
Management unit 25C, Study no: 15

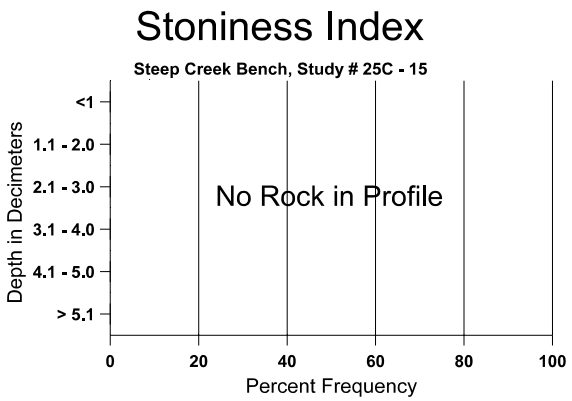
Species	Trees per Acre		Average diameter (in)	
	'98	'03	'98	'03
Juniperus osteosperma	26	25	22.8	13.0
Pinus edulis	33	35	8.9	6.2

BASIC COVER --
Management unit 25C, Study no: 15

Cover Type	Average Cover %				
	'87	'91	'94	'98	'03
Vegetation	3.75	4.75	13.81	20.29	12.87
Rock	0	0	.04	0	.04
Pavement	0	.25	.05	.13	.26
Litter	34.00	24.25	15.37	29.97	21.97
Cryptogams	4.00	6.00	1.75	14.82	.49
Bare Ground	58.25	64.75	63.95	46.70	72.27

SOIL ANALYSIS DATA --
Management unit 25C, Study no: 15, Study Name: Steep Creek Bench

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
22.4	65.3 (11.6)	7.2	89.4	4.4	6.2	0.3	3.0	67.2	0.4



PELLET GROUP DATA --
Management unit 25C, Study no: 15

Type	Quadrat Frequency		
	'94	'98	'03
Rabbit	33	34	46
Horse	-	3	-
Elk	-	-	2
Deer	12	18	6
Cattle	2	2	-

Days use per acre (ha)	
'98	'03
-	-
-	-
-	1 (2)
27 (67)	2 (5)
9 (22)	6 (14)

BROWSE CHARACTERISTICS --
Management unit 25C, Study no: 15

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Artemisia tridentata wyomingensis											
87	**532**	-	133	233	166	-	31	19	31	38	30/27
91	**466**	-	133	33	300	-	86	7	64	29	13/8
94	**780**	100	-	460	320	320	13	0	41	8	20/34
98	**680**	-	80	340	260	340	38	0	38	21	22/34
03	**740**	-	-	420	320	400	14	0	43	35	24/31
Chrysothamnus nauseosus											
87	**33**	-	33	-	-	-	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	0	123/34
98	**20**	-	-	20	-	-	0	0	-	0	-/-
03	**0**	-	-	-	-	-	0	0	-	0	35/48
Chrysothamnus viscidiflorus											
87	**0**	-	-	-	-	-	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	0	-/-
98	**40**	-	20	20	-	-	0	0	-	0	15/16
03	**160**	80	60	100	-	40	0	0	-	0	8/12
Ephedra viridis											
87	**0**	-	-	-	-	-	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	0	-/-
94	**20**	-	-	20	-	-	0	100	-	0	29/48
98	**0**	-	-	-	-	-	0	0	-	0	-/-
03	**100**	-	-	100	-	-	0	0	-	0	20/35
Gutierrezia sarothrae											
87	**2699**	-	600	1966	133	-	0	0	5	9	5/5
91	**233**	33	-	233	-	-	0	0	0	0	8/8
94	**1400**	-	300	1060	40	20	0	0	3	0	6/9
98	**3660**	440	1560	2080	20	160	0	0	1	.54	8/11
03	**460**	380	60	400	-	-	0	0	0	0	8/10
Juniperus osteosperma											
87	**33**	-	-	33	-	-	0	0	-	0	236/138
91	**33**	-	-	33	-	-	0	0	-	0	236/142
94	**0**	-	-	-	-	-	0	0	-	0	-/-
98	**40**	-	-	40	-	20	0	0	-	0	-/-
03	**40**	-	-	40	-	-	0	0	-	0	-/-

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Opuntia spp.											
87	**333**	33	100	233	-	-	0	0	0	0	3/6
91	**633**	100	400	200	33	-	5	0	5	5	4/10
94	**380**	-	20	360	-	-	0	0	0	0	3/16
98	**100**	-	20	80	-	-	0	0	0	0	4/12
03	**20**	-	-	20	-	-	0	0	0	0	4/7
Pinus edulis											
87	**33**	33	-	33	-	-	0	0	-	0	157/108
91	**33**	33	-	33	-	-	0	0	-	0	165/118
94	**0**	-	-	-	-	-	0	0	-	0	-/-
98	**40**	-	20	20	-	-	0	0	-	0	-/-
03	**40**	-	20	20	-	-	0	0	-	0	-/-